Trash Long-Term Reduction Plan and Progress Assessment Strategy

February 19, 2014

Submitted by:

City of Berkeley

In compliance with Provisions C.10.c of Order R2-2009-0074

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CITYOF BERKELEY
LONG-TERM TRASH LOAD REDUCTION PLAN AND ASSESSMENT STRATEGY

CERTIFICATION STATEMENT

"I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted, is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature by Duly Authorized Representative:

Andrew Clough
Director of Public Works

February 19, 2014

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ABBREVIATIONS

BASMAA	Bay Area Stormwater Management Agencies Association
BID	Business Improvement District
CalRecycle	California Department of Resources Recycling and Recovery
Caltrans	California Department of Transportation
CASQA	California Stormwater Quality Association
CDS	Continuous Deflection Separator
CEQA	California Environmental Quality Act
CY	Cubic Yards
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
GIS	Geographic Information System
MRP	Municipal Regional Stormwater NPDES Permit
MS4	Municipal Separate Storm Sewer System
NGO	Non-Governmental Organization
NPDES	National Pollutant Discharge Elimination System
Q	Flow
SFRWQCB	San Francisco Regional Water Quality Control Board
SWRCB	State Water Resource Control Board
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
Water Board	San Francisco Regional Water Quality Control Board
WDR	Waste Discharge Requirements

PREFACE

This Long-Term Trash Load Reduction Plan and Assessment Strategy (Long-Term Plan) is submitted in compliance with provision C.10.c of the Municipal Regional Stormwater NPDES Permit (MRP) for Phase I communities in the San Francisco Bay (Order R2-2009-0074). The Long-Term Plan was developed based on a regionally consistent outline and guidance developed by the Bay Area Stormwater Management Agencies Association (BASMAA) and reviewed by San Francisco Bay Regional Water Quality Control Board staff. Its content is based on the City of Berkeley's current understanding of trash problems within its jurisdiction and the effectiveness of control measures designed to reduce trash impacts associated with Municipal Separate Storm Sewer (MS4) discharges. This Long-Term Plan is intended to be iterative and may be modified in the future based on information gained through the implementation of trash control measures. The City of Berkeley therefore reserves the right to revise or amend this Long-Term Plan at its discretion. If significant revisions or amendments are made by the City, a revised Long-Term Plan will be submitted to the Water Board through the City's annual reporting process.

1.0 Introduction

1.1 Purpose of Long-Term Trash Reduction Plan

The Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit for Phase I communities in the San Francisco Bay (Order R2-2009-0074), also known as the Municipal Regional Permit (MRP), became effective on December 1, 2009. The MRP applies to 76 large, medium and small municipalities (cities, towns and counties) and flood control agencies in the San Francisco Bay Region, collectively referred to as Permittees. Provision C.10.c of the MRP requires Permittees to submit a *Long-Term Trash Load Reduction Plan* (Long-Term Plan) by February 1, 2014. Long-Term Plans must describe control measures that are currently being implemented, including the level of implementation, and additional control measures that will be implemented and/or increased level of implementation designed to attain a 70% trash load reduction by July 1, 2017, and 100% (i.e., "No Visual Impact") by July 1, 2022.

This Long-Term Plan is submitted by the City of Berkeley in compliance with MRP provision C.10.c. Consistent with provision C.10 requirements, the goal of the Long-Term Plan is to solve trash problems in receiving waters by reducing the impacts associated with trash in discharges from Berkeley's municipal separate storm sewer system (MS4) that are regulated by NPDES Permit requirements. The Long-Term Plan includes:

1. Descriptions of the current level of implementation of trash control measures, and the type and extent to which new or enhanced control measures will be implemented to achieve a target of 100% (i.e. full) trash reduction from MS4s by July 1, 2022, with an interim milestone of 70% reduction by July 1, 2017;
2. A description of the *Trash Assessment Strategy* that will be used to assess progress towards trash reduction targets achieved as a result of control measure implementation; and,
3. Time schedules for implementing control measures and the assessment strategy.

The Long-Term Plan was developed based on a regionally consistent outline and guidance developed by the Bay Area Stormwater Management Agencies Association (BASMAA) and reviewed by the San Francisco Bay Regional Water Quality Control Board (Water Board) staff. The Long-Term Plan is consistent with the Long-Term Trash Load Reduction Framework (see section 1.2.1) developed in collaboration with Water Board staff. Its content is based on Berkeley's current understanding of trash problems within its jurisdiction and the effectiveness of control measures designed to reduce trash impacts associated with Municipal Separate Storm Sewer (MS4) discharges. The Long-Term Plan builds upon trash control measures implemented by the City prior to the adoption of the MRP and during the implementation of the Short-Term Trash Load Reduction Plan submitted to the Water Board on March 2, 2012.

1.2 Background

1.2.1 Long-Term Trash Load Reduction Plan Framework

A workgroup of MRP Permittee representatives and Water Board staff met between October 2012 and March 2013 to better define the process for developing and implementing Long-Term Plans, methods for assessing progress toward reduction goals, and tracking and reporting requirements associated with provision C.10. Through these discussions, an eight-step framework for developing and implementing Long-Term Plans was created by the workgroup (Figure 1).

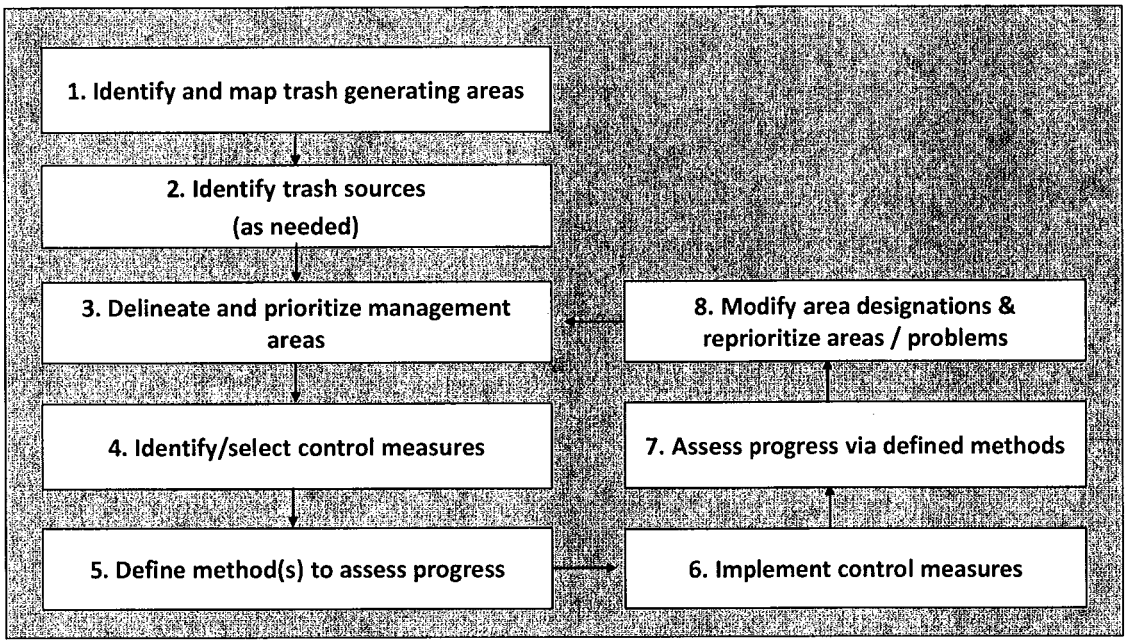


Figure 1-1. Eight-step framework for developing, implementing and refining Long-Term Trash Reduction Plans.

The workgroup agreed that as the first step in the framework, Permittees would identify very high, high, moderate, and low trash generating areas in their jurisdictional areas. Trash generation rates developed through the *BASMAA Baseline Trash Generation Rates Project* (as discussed below) were used as a starting point for differentiating and delineating land areas with varying levels of trash generation. Permittees would then use local knowledge and field and/or desktop assessments to confirm or refine the level of trash generation for specific areas within their jurisdiction. Each Permittee would then develop a map depicting trash generation categories within their jurisdiction.

As a next step, Permittees would then delineate and prioritize Trash Management Areas (TMAs) where specific control measures exist or are planned for implementation. TMAs delineated by Permittees are intended to serve as reporting units in the future. Reporting at the management area level provides the level of detail necessary to demonstrate implementation and progress towards trash reduction targets.

Once control measures are selected and implemented, Berkeley will review and consider methods to assess progress towards reducing trash. As the results of the progress assessments are available, Berkeley may choose to reprioritize trash management areas and associated control measures designed to improve trash reduction within their jurisdictions.

1.2.2 BASMAA Generation Rates Project

Through approval of a BASMAA regional project in 2010, Permittees agreed to work collaboratively to develop a regionally consistent method to establish trash generation rates within their jurisdictions. The project, also known as the *BASMAA Trash Generation Rates Project* (Generation Rates Project) assisted Permittees in establishing the rates of trash generation and identifying very high, high, moderate and low trash generating areas.

The term "trash generation" refers to the rate at which trash is produced or generated onto the surface of the watershed and is potentially available for transport via MS4s to receiving waters. Generation rates do not explicitly take into account existing control measures that intercept trash prior to transport. Generation rates are expressed as trash volume/acre/year and were established via the Generation Rates Project.

In contrast to trash generation, the term "trash loading" refers to the rate at which trash from MS4s enters receiving waters. Trash loading rates are also expressed as trash volume/acre/year and are equal to or less than trash generation rates because they account for the effects of control measures that intercept trash generated in an area before it is discharged to a receiving water. Trash loading rates are specific to particular areas because they are dependent upon the effectiveness of control measures implemented within an area. Figure 1-2 illustrates the difference between trash generation and loading.

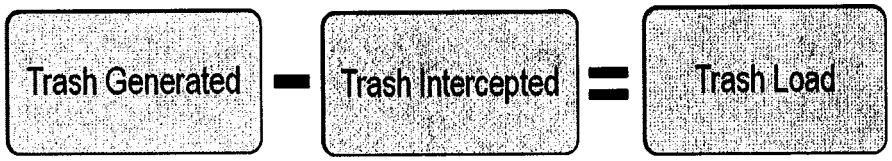


Figure 1-2. Conceptual model of trash generation, interception and load.

Trash generation rates were estimated based on factors that significantly affect trash generation (i.e., land use and income). The method used to the establish trash generation rates for each Permittee builds off "lessons learned" from previous trash loading studies conducted in urban areas (Allison and Chiew 1995; Allison et al. 1998; Armitage et al. 1998; Armitage and Rooseboom 2000; Lippner et al. 2001; Armitage 2003; Kim et al. 2004; County of Los Angeles 2002, 2004a, 2004b; Armitage 2007). The method is based on a conceptual model developed as an outgrowth of these studies (BASMAA 2011b).

Trash generation rates were developed through the quantification and characterization of trash captured in Water Board-recognized full-capture treatment devices installed in the San Francisco Bay area. Trash generation rates estimated from this study are listed for each land use type in Table 1-1. Methods used to develop trash generation rates are more fully described in BASMAA (2011b, 2011c, and 2012).

Table 1-1. San Francisco Bay Area trash generation rates by land use (gallons/acre/year).

Land Use	Low[b]	Best[b]	High[b]
Commercial & Services	0.7	**6.2**	17.3
Industrial	2.8	**8.4**	17.8
Residential[a]	0.3 - 30.2	**0.5 - 87.1**	1.0 - 257.0
Retail[a]	0.7 - 109.7	**1.8 - 150.0**	4.6 - 389.1
K-12 Schools	3	**6.2**	11.5
Urban Parks	0.5	**5.0**	11.4

[a] For residential and retail land uses, trash generation rates are provided as a range that takes into account the correlation between rates and household median income.

[b] For residential and retail land uses: Low = 5% confidence interval; Best = best fit regression line between generation rates and household median income; and, High = 95% confidence interval. For all other land use categories: High = 90th percentile; Best = mean generation rate; and, Low = 10th percentile.

1.3 Organization of Long-Term Plan

This Long-Term Plan is organized into the following sections:

1.0 Introduction;
2.0 Scope of the Trash Problem;
3.0 Trash Management Areas and Control Measures;
4.0 Progress Assessment Strategies; and
5.0 References

Section 2.0 is intended to provide a description of the extent and magnitude of the trash problem in the City of Berkeley. Control measures that will be implemented by City of Berkeley as a result of this Long-Term Plan are described in section 3.0. Section 4.0 describes the methods that Berkeley will consider using to assess progress toward trash reduction targets.

2.0 Scope of the trash Problem

2.1 Permittee Characteristics

Incorporated in 1878, the City of Berkeley is located in Alameda County, whose city limits encompass 7,474 land acres. According to the 2010 Census, it has a population of 112,580, with a population density of 9,630 people per square mile and average household size of 2.5. Of the 112,580 residents who call Berkeley home, 13% are under the age of 18, 24%, are between 18 and 24, 28% are between 25 and 44, 24% are between 45 and 64, and 11% are 65 or older. The median household income was $59,100 in 2010. The City of Berkeley is the home of the University of California (UC) and the Lawrence Berkeley National Laboratory (LBL). Interstate 80, California Highways 13 and 123 cross through Berkeley. The activities within UC, LBL, I-80, Hwy 13, and Hwy 123 properties are all outside the jurisdiction of the City yet contribute to the trash found within the City's jurisdiction.

Land uses within the City of Berkeley depicted in ABAG (2005) are provided in Table 2. The City of Berkeley is primary comprised of 6 land uses as shown in Table 2-1.

Table 2-1. Percentages of the City of Berkeley's jurisdictional area[1] within land use classes identified by ABAG (2005)

Land Use Category	Jurisdictional Area (Acres)	% of Jurisdictional Area
Commercial and Services	393.5	6.5%
Industrial	452.1	7.4%
Residential	4,302	69.0%
Retail	302.3	5.0%
K-12 Schools	167.6	2.8%
Urban Parks	461.6	7.6%

2.2 Trash Generating Areas

2.2.1 Generation Categories and Designation of Areas

The process and methods used to identify the level of trash generation within the City of Berkeley are described in this section and illustrated in Figure 2-1.

[1] A Permittee's jurisdictional area is defined as the urban land area within a Permittee's boundary that is not subject to stormwater NPDES Permit requirements for traditional and non-traditional small MS4s (i.e. Phase II MS4s) or the California Department of Transportation, or owned and maintained by the State of California, the U.S. federal government or other municipal agency or special district (e.g., flood control district).

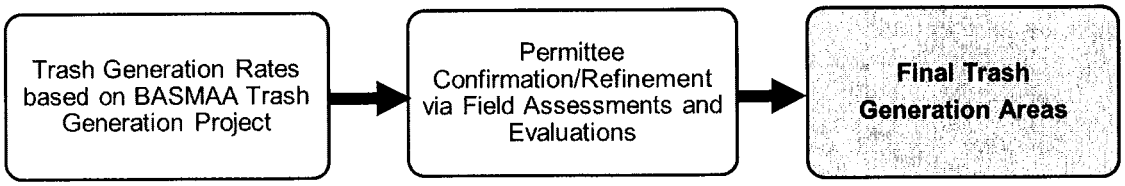


Figure 2-1. Development of Trash Generation Areas

As a first step, trash generation rates developed through *the BASMAA Trash Generation Rates Project* were applied to parcels within the City of Berkleey based on current land uses and 2010 household median incomes. A Draft Trash Generation Map was created as a result of this application. The draft map served as a starting point for the City of Berkeley to identify trash generating levels. Levels of trash generation are depicted on the map using four trash generation rate (gallons/acre/year) categories that are symbolized by four different colors illustrated in Table 2-2.

Table 2-2. Trash generation categories and associated generation rates (gallons/acre/year).

Category	Very High		Moderate	Low
Generation Rate (gallons/acre/year)	>50		5-10	<5

The City of Berkeley then reviewed and refined the draft trash generation map to ensure that trash generation categories were correctly assigned to parcels or groups of parcels. City staff refined maps using the following process:

1. Based upon our knowledge of trash generation and problem areas within the City, staff identified areas on the draft map that potentially had incorrect trash generation category designations.
2. Trash generation category designations initially assigned to areas identified in step #1 were then assessed and confirmed/refined by the City using the methods listed below.

a. On-Land Visual Assessments

To assist Permittees with developing their trash generation maps, BASMAA developed a *Draft On-land Visual Trash Assessment Protocol (Draft Protocol)*. The Draft Protocol entails walking a street segment and visually observing the level of trash present on the roadway, curb and gutter, sidewalk, and other areas adjacent to the street that could potentially contribute trash to the MS4. Based on the level of trash observed, each segment (i.e., assessment area) was placed into one of four on-land assessment condition categories that are summarized in Table 2-3. The City

used the Draft Protocol in a limited area of downtown Berkeley refining trash generating area designations.

Table 2-3. Definitions of on-land trash assessment condition categories.

On-land Assessment Condition Category	Summary Definition
A (Low)	Effectively no trash is observed in the assessment area.
B (Moderate)	Predominantly free of trash except for a few pieces that are easily observed.
C (High)	Trash is widely/evenly distributed and/or small accumulations are visible on the street, sidewalks, or inlets.
D (Very High)	Trash is continuously seen throughout the assessment area, with large piles and a strong impression of lack of concern for litter in the area.

b. Querying Municipal Staff or Members of the Public

The City has an extensive program to maintain clean conditions throughout the City. Field staff responsible for supervising cleaning crews, street sweeping, removing and clean-up of illegal dumpings reviewed the trash generation maps for the entire City.

c. Reviewing Municipal Operations Data

Maintenance supervisors routinely review data from trash related operations to identify needs and changes. Municipal operations staff used this knowledge in reviewing trash generation.

3. Based on assessments conducted to confirm/refine trash generation category designations, the City created a final trash generation map that depicts the most current understanding of trash generation within the City of Berkeley. The City documented this process by tracking the information collected through the assessments and subsequent refinements to the Draft Trash Generation Map. The City of Berkeley's Trash Generation and Full Trash Capture Devices Map, Feb 2014 is included as Figure 2-2.

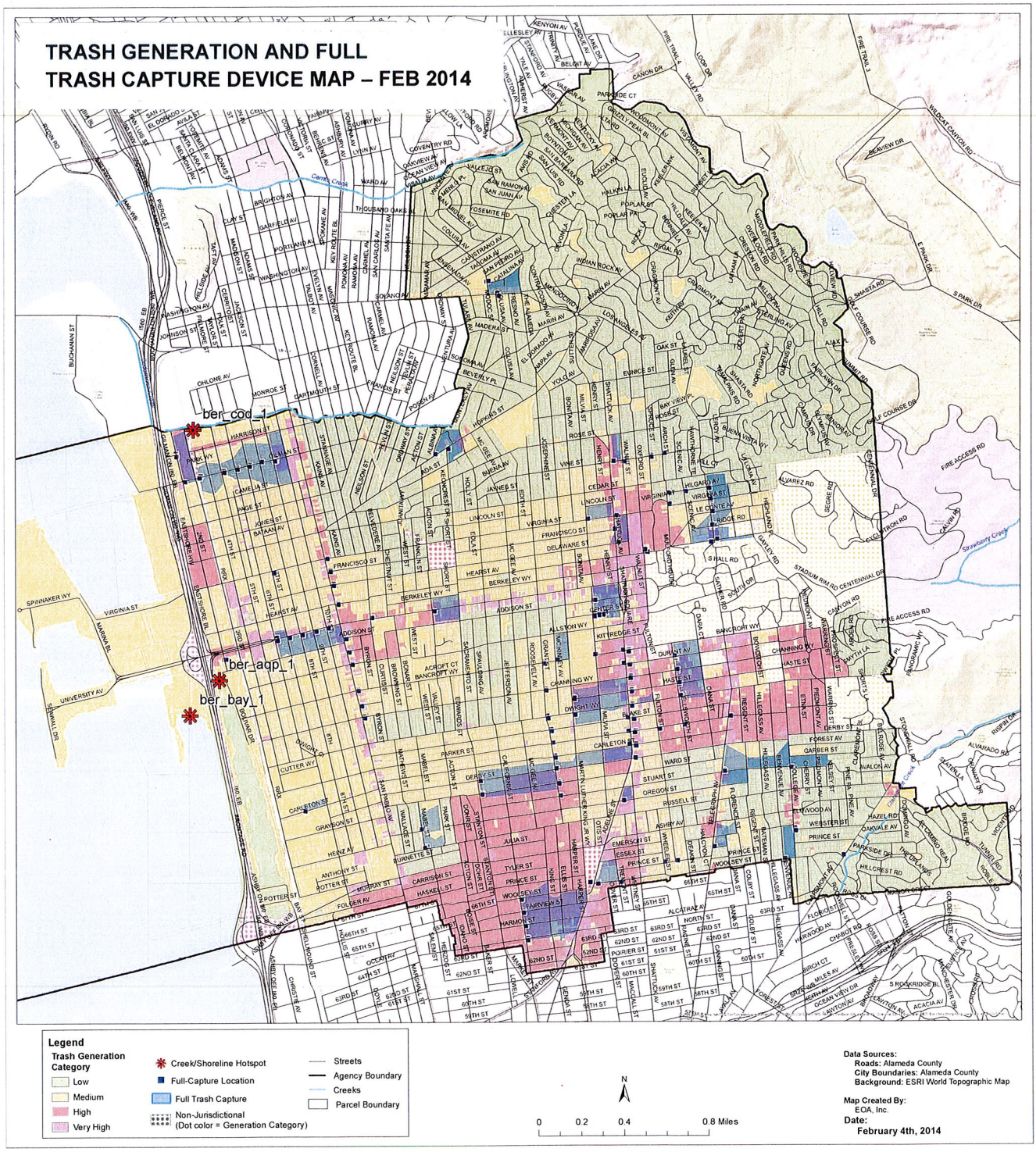
2.2.2 Summary of Trash Generating Areas and Sources

Summary statistics for land use and trash generation categories generated through the mapping and assessment process are presented in Table 2-4.

Table 2-4. Percentage of jurisdictional area within the City of Berkeley assigned to each trash generation category.

Trash Generation Category	Jurisdic-tional Area (Ac)	Commercial and Services	Industrial	Residential	Retail	K-12 Schools	Urban Parks
Very High	216	0%	0%	0%	100%	0%	0%
High	763	1.6%	7.2%	82.8%	8.1%	0.2%	0.1%
Medium	2317	16.4%	17.1%	39.4%	1.0%	6.3%	19.8%
Low	2791	0.1%	0%	95.2%	0%	0.7%	0.1%

FIGURE 2-2


TRASH GENERATION AND FULL
TRASH CAPTURE DEVICE MAP – FEB 2014
ber_cod_1
ber_aqp_1
ber_bay_1
Legend
Trash Generation Category
Low
Medium
High
Very High
Creek/Shoreline Hotspot
Full-Capture Location
Full Trash Capture
Non-Jurisdictional
(Dot color = Generation Category)
Streets
Agency Boundary
Creeks
Parcel Boundary
N
0
0.2
0.4
0.8 Miles
Data Sources:
Roads: Alameda County
City Boundaries: Alameda County
Background: ESRI World Topographic Map
Map Created By:
EOA, Inc.
Date:
February 4th, 2014

3.0 Trash management areas and control measures

This section describes the control measures that the City of Berkeley has or plans to implement to solve trash problems and achieve a target of 100% (i.e. full) trash reduction from their MS4 by July 1, 2022. The selection of control measures described in this section is based on the City of Berkeley's current understanding of trash problems within its jurisdiction and the effectiveness of control measures designed to reduce trash impacts associated with MS4 discharges. Information on the effectiveness of some trash control measures is currently lacking and therefore in the absence of this information, the City of Berkeley based its selection of control measures on existing effectiveness information, their experience in implementing trash controls and knowledge of trash problems, and costs of implementation. As knowledge is gained through the implementation of the trash control measures presented in this plan and development of trash control in the region, the City of Berkeley reserves the right to revise or amend the trash control strategy described in this section. If significant revisions or amendments are made, a revised Long-Term Plan will be submitted to the Water Board through the City of Berkeley's annual reporting process.

3.1 Management Area Delineation and Prioritization

The City of Berkeley began delineating and prioritizing trash management areas (TMAs) based on the geographical distribution of trash generating areas, types of trash sources, and current or planned control measure locations. TMAs are intended to form the management units by which trash control measure implementation can be tracked and assessed for progress towards trash reduction targets. Once delineated, TMAs will also be prioritized for control measure implementation.

Berkeley voters passed the Measure M Bond Measure in November 2012 with 73% yes votes. This work will begin in the Summer of 2014 and continue for five years. The City has allocated approximately $2 million for LID in the first two years. The area of work covered by Measure M includes streets distributed throughout the City and is not defined for the third through fifth years, thus Berkeley is unable to provide a well defined map showing the TMAs. The City anticipates that the Measure M sites will be defined in the last quarter of FY2013-2014 or early FY 2014-2015. The City participated in the ABAG Bay Area Wide Trash Capture Demonstration Project and installed 196 full trash capture devices. There will be overlap between the ABAG project sites and Measure M LID projects and the City will explore relocating redundant ABAG project sites to avoid duplicating Measure M sites. The City will provide an updated map with the 2013-2014 Annual Report. Figure 2-2 shows the locations of the ABAG sites from available data.

3.2 Current and Planned Trash Control Measures

The City of Berkeley has an extensive existing (before December 2009 when the MRP became effective) trash control program. Elements of this program include:

- *Enhanced Street Sweeping. This includes monthly posted no parking on street sweeping days with follow up parking enforcement, and sweeping commercial areas multiple times a week.*
- *Polystyrene Foam Food Service Ware Ban. The City is one of the first government agencies in the country to regulate polystyrene foam containers, being in place since the early 1980s and is now considered normal practice.*
- *Public education and outreach. Public outreach includes participating in the regional outreach campaigns, countywide programs outreach activities to school age children, conducting outreach at events such as Earth Day, Bay Festival, Solano Stroll, Berkeley Project and others.*
- *Trash Bin and Container Management and Business Improvement Districts. Staff monitor the level of service provided to customers to minimize trash discharge from spillage. Additionally, some business districts such as the Downtown Business Association have formed Business Improvement Districts.*

The City of Berkeley implemented (since Dec 2009 when the MRP became effective) and anticipates implementing the following trash control measures:

- *Reduce Trash From Uncovered Loads. Secured load enforcement will enforce existing State Vehicle Code Section 23115 and implement a charge to the tipping fee for unsecured (uncovered) loads.*
- *Measure M LID Facilities. The City is accelerating its paving program and will install stormwater treatment facilities. This program is anticipated to provide over $2 million for treatment facilities. The locations have not been determined.*
- *Single Use Bag Ban. The City adopted the Alameda County Waste Management Authority ordinance prohibiting distribution of single-use carryout bags.*
- *Full Trash Capture Devices. The City has received 196 installed full trash capture devices through the ABAG Bay Area Wide Trash Capture Demonstration Project. The units installed in this program may be relocated in order to coordinate with facilities from Measure M. The City is planning to install additional devices to meet the final trash reduction goal.*

3.2.1 Trash Management Area #1

TMA #1 is for small full trash capture devices installed inside catch basins or inlets. The City installed 196 full trash capture devices between December 2009 and before July 1, 2014, locations are shown in Figure 2-2. The current locations are subject to change an locations for future installations are not know because of needed coordination with Measure M facilities. Street sweeping will continue. City will explore relocating redundant ABAG project sites to avoid duplicating Measure M sites. The City will provide an updated map with the 2013-2014 Annual Report. Figure 2-2 shows the locations of the ABAG sites from available data.

3.2.2 Trash Management Area #2

TMA #2 will be LID treatment facilities. These facilities will be installed as part of Measure M paving and will be defined and provided to the Water Board in an update with the FY 2013-2014 Annual Report. These facilities will be installed after July 1, 2014. Street sweeping will continue. The City will provide an updated map with the 2013-2014 Annual Report. Figure 2-2 shows the locations of the ABAG sites from available data.

3.2.3 Jurisdiction-wide Control Measures

Following are activities that do not have geographic limits or boundaries.

Polystyrene Foam Food Service Ware Ban

The City was one of the first agencies in the country to regulate polystyrene foam containers, being in place since the 1980s and is now considered normal practice. http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=11068.

Alameda County Waste Management Authority Single-Use Bag Ban Ordinance

Single-Use plastic bags were a significant component of the litter found in storm drains and water bodies throughout Alameda County. To address this issue, the Alameda County Waste Management Authority has adopted a single-use bag ban. As of January 1, 2013, all grocery stores, supermarkets, mini-marts, convenience stores, liquor stores, pharmacies, drug stores or other entities that sell milk, bread, soda and snack foods (all four items) and/or alcohol (Type 20 or21 license) in Alameda County must comply with the Single-Use Bag Ban Ordinance.

Single-Use Bag Requirement: Affected stores may no longer provide customers with single-use bags at check-out.

Bag Sales Requirements:

- Affected stores that distribute recycled paper or reusable bags must charge 10 cents or more per bag. These bags must meet the specifications in the Ordinance.
- All proceeds from the sale of recycled paper bags and reusable bags are retained by the retailer without any restrictions on their use

A copy of the Ordinance is available on the Alameda County Waste Management Authority's website: http://reusablebagsac.org/ordinancetext.html

The City of Berkeley is a member of ACCWP. The jurisdiction-wide control measures described below will be conducted through participation in ACCWP.

Litter Outreach to K-12 Schools

K-12 schools are often high litter generation areas. ACCWP has developed a request for proposal for a four-year litter reduction education/outreach grant directed at K-12 schools throughout Alameda County. ACCWP intends to award a total of up to

$125,000 per year to up to 4 successful applicants. The goals of the project are to clearly reduce the amount of litter at the participating schools and incorporate institutional changes at the schools so that litter will continue to be reduced in the future. Implementation is scheduled to begin in the 2014/15 school year. The request for proposal will include a requirement to evaluate the level of litter reduction achieved. A description of the successful proposals will be included in the ACCWP Fiscal Year 2013/14 Annual Report.

"Be the Street" Youth Anti-Litter Advertising Campaign

Intentional litter by youth has been found to be a significant contributor to litter problems. To address this issue, ACCWP has participated in the development and implementation of the Be the Street campaign. Be the Street is a Bay Area wide outreach effort that takes a Community Based Social Marketing approach to encourage youth to keep their community clean (http://www.bethestreet.org/). The intent of the campaign is to make "no-littering" the norm among the target audience (youth between the ages of 14 and 24). The campaign is a three-year effort that began in fiscal year 2011-12 and will run through 2013-14. ACCWP has been participating in and providing financial support to the Be the Street campaign since its inception. The campaign will be evaluated in the spring of 2014. Depending upon the results of the evaluation, ACCWP may continue to participate in this or similar efforts in future years.

Multi-Family Dwelling Litter Outreach

Multi-family dwellings (i.e., apartment buildings and condominium complexes) are often areas of high trash generation. ACCWP is working with the City of Livermore to develop a litter reduction pilot targeting multi-family complexes known to be sites with significant litter issues. The pilot includes the following apartment building and condominium complexes: Livermore Garden Apartments (5720 East Avenue), La Castilleja (975 Murrieta Boulevard), and Castilleja Del Arroyo (1001 and 1009 Murrieta Boulevard).

- December 2013: Pre-campaign Measurement – ACCWP and the City will take baseline measurements of all three sites. Methods of measurement will include taking photos of on-site litter, as well as collecting, characterizing and counting the litter using the Ocean Conservancy's Volunteer Trash Data Form. (Adopt A Creek Spot volunteers use this Data Form to characterize and count the trash collected from the Trash Hot Spot located behind the condominium complexes on Coastal Clean-up Day.) Areas to be measured include landscaped and other common areas, the sidewalk, gutter and streets located in front of the sites. All three property managers/volunteers will collect one week's worth of on-site litter.

- November – December 2013: Research – All three property managers will be interviewed by City staff using twenty-five questions developed by the ACCWP. The interview results will help define the target audience(s) (i.e., age groups, income level, ethnic groups, etc.) and determine outreach tactics (i.e., face-to-face, signage, printed materials, etc.) This information will also assist the City and ACCWP in developing appropriate messaging.

- November 2013 – January 2014: Plan – One of the three sites will be chosen as the "Control" site. In addition, outreach strategies and tactics will be selected for the "Active" sites.

- February 2014: Concept/Design/Content Production – Selected outreach tactics will be designed and produced for the Active sites.

- February 2014: Multi-cultural Advising, Translation – Consultant will advise on outreach tactics and messaging, and will provide translation as needed.

- March 2014 – May 16, 2014: Outreach – Outreach tactics will be rolled out at Active sites.

- May 17, 2014 – May 31, 2014: Post-campaign Measurement — City staff and ACCWP will duplicate the pre-campaign measurement methodologies at all three sites, including the Control. All three property managers/volunteers will collect one week's worth of on-site litter. On-site and off-site litter will be characterized and counted by City staff using the Ocean Conservancy's Volunteer Trash Data Form. All three property managers will be interviewed by City staff to help determine residents' attitudes/change in behavior, etc.

- June 1, 2014 – June 30, 2014: Reporting – Final Pilot Report will be presented to ACCWP member agencies.

Depending on the success of the pilot, it may be replicated at other multi-family complexes throughout the County.

The Public Information and Participation Subcommittee of ACCWP also is in the process of identifying other litter-related areas and activities that affect jurisdictions throughout the County, and will implement pilot projects to address the high priority issues over the next several years. One issue being considered is cigarette butt litter.

Community Stewardship Grants

Through its Community Stewardship Grants program ACCWP provides up to $20,000 per year to individuals and community groups to implement stormwater and watershed enhancement and education projects. The grants range from $1,000 to $5,000. Starting in fiscal year 2014/15 ACCWP will specifically encourage and support litter reduction grant applications. The projects of the Fiscal Year 2014/15 grant recipients will be described in the ACCWP Fiscal Year 2013/14 Annual Report.

Anti-Litter Outreach to Residents

Through its Public Information and Participation program ACCWP encourages residents to adopt less polluting behaviors. One targeted behavior is littering, both intentional and unintentional. ACCWP uses a variety of mechanisms to influence residents including public service announcements, online and movie theater advertising, and participating in outreach events. The ACCWP Public Information and Participation Subcommittee is in the process of developing a three-year budget/strategic plan for

fiscal years 2014/15 through 2016/17. One of the strategic objectives of the plan will be to reduce litter. This plan will be described in the ACCWP Fiscal Year 2013/14 Annual Report.

3.2.4 Creek and Shoreline Hot Spot Cleanups

In compliance with the MRP the City has identified 3 Hot Spots. These sites are Codornices Creek between 2nd Street and 5th Street, North End of Aquatic Park, and Brickyard Cove along the Bay Shoreline. The trash source for Codornices Creek is from the upstream watershed and local park activities. The trash source for Aquatic Park is I-80, park activities, and stormwater input. The trash source for Brickyard Cove is primarily carried in from Bay waters. These hot spots have been cleaned since the adoption of the MRP. The City has supported and assigned staff to hold the annual Coastal Clean-Up. Typical trash removal from Codornices Creek, Aquatic Park, and Brickyard Cove are 420 lbs, 50 lbs, and 50 lbs, respectively.

3.2.5 Summary of Trash Control Measures

Trash Management Area 1

- Full trash capture devices will be installed in various sites
- Installations must be coordinated with LID treatment facilities from the City implementing Measure M
- Full trash capture devices will meet the 5mm mesh performance requirement to be considered as full trash capture

Trash Management Area 2

- Low Impact Development (LID) treatment facilities will be installed at various locations in coordination with the City's enhanced paving program made possible by Measure M
- LID treatment will include screens or equivalent openings to meet the 5mm performance requirement to be considered as full trash capture.

3.3 Control Measure Implementation Schedule

Table 3-1 shows the schedule for implementing control measures. Updates to the TMAs will be provided along with the Annual Report for FY 2103-2014.

Table 3-1. City of Berkeley completed and planned trash control measure implementation schedule.

Trash Management Area and Control Measures	Pre-MRP	Short-Term					Long-Term							
		FY 2009-2010	FY 2010-2011	FY 2011-2012	FY 2012-2013	FY 2013-2014[a]	FY 2014-2015	FY 2015-2016	FY 2016-2017[b]	FY 2017-2018	FY 2018-2019	FY 2019-2020	FY 2020-2021	FY 2021-2022[c]
TMA #1														
Full Trash Capture Inlet Screen					X			X	X	X	X	X	X	X
Enhanced Street Sweeping	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TMA #2														
LID Treatment (Measure M)						X	X	X	X	X				
Enhanced Street Sweeping	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Jurisdiction-wide Control Measures														
Polystyrene Foam Food Serve Ware Ban	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Reduce Trash, Uncovered Loads							X	X	X	X	X	X	X	X
Trash Bin/Cont Mgmt & BIDs	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Single-Use Bag Ban					X	X	X	X	X	X	X	X	X	X
K-12 School Outreach						X	X	X	X	Activities to be determined				
Be the Street campaign				X	X	X	Activities to be determined							
Multi-Family Dwelling Outreach						X	Activities to be determined							
Community Stewardship Grants (litter)							X	Activities to be determined						
Litter related outreach to residents	X	X	X	X	X	X	X	X	Activities to be determined					
Creek and Shoreline Hot Spot Cleanups, 3 Sites				X	X	X	X	X	X	X	X	X	X	X

[a] July 1, 2014 - 40% trash reduction target
[b] July 1, 2017 - 70% trash reduction target
[c] July 1, 2022 - 100% trash reduction target

4.0 Progress Assessment strategy

Provision C.10.a.ii of the MRP requires Permittees to develop and implement a trash load reduction tracking method that will be used to account for trash load reduction actions and to demonstrate progress and attainment of trash load reduction targets. Early into the MRP, Permittees decided to work collaboratively to develop a trash load reduction tracking method through the Bay Area Stormwater Management Agencies Association (BASMAA). Permittees, Water Board staff and other stakeholders assisted in developing Version 1.0 of the tracking method. On behalf of all MRP Permittees, the Bay Area Stormwater Management Agencies Association (BASMAA) submitted Version 1.0 to the Water Board on February 1, 2012.

The Trash Assessment Strategy (Strategy) described in this section is intended to serve as Version 2.0 of the trash tracking method and replace version 1.0 previously submitted to the Water Board. The Strategy is specific to Permittees participating in the Alameda Countywide Clean Water Program (ACCWP). The City of Berkeley has cooperated with the ACCWP and BASMAA in developing the assessment strategies and protocols. However, the City of Berkeley will implement assessment methods as determined solely by the City of Berkeley to meet permit requirements imposed on Berkeley. In the near term, the City will work with the ACCWP n the pilot implementation. Elements of Berkeley's progress assessment strategy are described in the following sections.

4.1 ACCWP Pilot Assessment Strategy

The following ACCWP Pilot Trash Assessment Strategy (ACCWP Pilot Strategy) was developed by ACCWP on behalf of the City and other Permittees in Alameda County. The ACCWP Pilot Strategy will be implemented at a pilot scale on a countywide basis and includes measurements and observations in the City of Berkeley.

4.1.1 Management Questions

The ACCWP Pilot Strategy is intended to answer the following management questions over time as trash control measures outlined in section 3.0 are implemented and refined:

- Are specific control measures effective?
- Is the amount of trash in and along local waterways declining?
- Are control measures being implemented appropriately?

The ACCWP Pilot Strategy, including indicators and methods, is summarized in this section. These indicators are intended to detect progress towards trash load reduction targets and solving trash problems.

4.1.2 Indicators of Progress and Success

To track progress, both outcome and output indicators will be assessed. Outcome-based indicators are those that measure the result of litter reduction efforts. This type of

indicator could include measurements of litter in and around the storm drain system or local water bodies. Output-based indicators are those that assess the implementation of control measures. This type of indicator could include assessing the maintenance of trash capture devices or compliance with product bans. Indicators that ACCWP Permittees will use to answer the management questions include:

Outcome-Based Indicators:

1-A Amount of single-use plastic bags entering storm drains
1-B Amount of polystyrene food ware entering storm drains
1-C Amount of litter removed from Trash Hot Spots and other creek/shoreline cleanup events
1-D Amount of litter at schools participating in the litter outreach program
1-E Amount of litter at multi-family dwellings participating in the targeted outreach program
1-F Self-reported litter related attitude and behavior of residents

Output-Based Indicators:

2-A Full capture device operation and maintenance
2-B Compliance with the Single-Use Bag Ban
2-C Implementation of an effective street sweeping program
2-D Commercial Trash Container Management
2-E Residential Trash Container Management

In selecting the indicators above, ACCWP Permittees recognize that no one environmental indicator will provide the information necessary to effectively determine progress made in reducing trash discharged from MS4s and improvements in the level of trash in receiving waters. Multiple indicators were therefore selected.

Trash is transported to receiving waters from pathways other than MS4s, which may confound our ability to observe MS4-associated reductions in creeks and shorelines. Evaluations of data on the amount of trash in receiving waters that are conducted over time through the Pilot Assessment Strategy will assist the City in further determinations of the important sources and pathways causing problems in local creeks, rivers and shorelines.

4.1.3 Pilot Assessment Methods

This section briefly summarizes the preliminary assessment methods to generate indicator information described in the previous section. Additional information on each method can be found in the ACCWP Pilot Trash Assessment Strategy submitted to the Water Board by ACCWP on behalf of the City.

OUTCOME-BASED INDICATORS

1-A Amount of Single-Use Plastic Bags Entering Storm Drains

ACCWP participated in the development of the BASMAA baseline trash generation rate study. A total of 47 drop inlet full trash capture devices located throughout Alameda County were included in the study. The study included an assessment of the volume and number of single-use plastic bags found in these 47 inlets as well as over 100 other inlets from throughout the Bay Area. Since the conclusion of the study, the Alameda County Waste Management Authority has adopted a single-use bag ban. As of January 1, 2013, all grocery stores, supermarkets, mini-marts, convenience stores, liquor stores, pharmacies, drug stores or other entities that sell milk, bread, soda and snack foods (all four items) and/or alcohol (Type 20 or21 license) in Alameda County must comply with the Single-Use Bag Ban Ordinance.

ACCWP will conduct a follow-up study to assess the number and volume of single-use plastic bags in storm drain inlets throughout the County following the implementation of the bag ban. The study will consist of re-sampling most or all devices sampled during the previous study and comparing the number of single-use bags found before versus after the implementation of the bag ban. ACCWP will also sample up to 50 additional full trash capture inlet devices from high and medium trash generating areas throughout the County and compare the number of single-use bags found in all of the sampled inlets in Alameda County after the adoption of the bag ban versus the number of bags found in inlets throughout the Bay Area during the baseline trash generation rate study. ACCWP is planning to assess the level of single-use and other trash in all of the approximately 100 inlets again after several years to assess the overall decline in trash over time. A detailed study design is included in the ACCWP Pilot Assessment Strategy to be submitted separately.

1-B Amount of Polystyrene Food Ware Entering the Storm Drain System

As noted above, ACCWP participated in the development of the BASMAA baseline trash generation rate study. A total of 47 drop inlet full trash capture devices located throughout Alameda County were included in the study. The study included an assessment of the volume and number of expanded polystyrene (EPS) food ware items found in these 47 inlets as well as over 100 other inlets from throughout the Bay Area. A majority of the fourteen cities within Alameda County have adopted expanded polystyrene food ware bans. San Leandro and Pleasanton adopted their expanded polystyrene bans after the completion of the BASMAA baseline trash generation rate study.

ACCWP will conduct a follow-up study to assess the effectiveness of the EPS food ware bans at reducing the amount of EPS entering the storm drain system. As San Leandro and Pleasanton have adopted their ban since the completion of the baseline study, the follow-up study will compare the volume and number of EPS food ware items in the full trash capture devices in those two cities before and after the implementation of the bans. ACCWP will also sample a total of up to 100 full trash capture inlet devices from throughout the County and compare the number and volume of EPS food ware items in areas with versus without EPS bans. A detailed study design is included in the ACCWP Pilot Assessment Strategy to be submitted separately.

1-C Amount of Litter Removed from Trash Hot Spots and Other Creek/Shoreline Cleanup Events

ACCWP member agencies collect trash annual from a total of 47 Hot Spots as well as numerous additional creek and shoreline cleanup events. Each member agency will gather data from these events that will allow for long term tracking of trends. The data to be collected include the volume and or weight of trash removed, the number of people and or the total number of person hours for each event, the length of creek or shoreline cleaned, and the dominant types of trash at each location. ACCWP will compile the data from these events and track the long term trends in trash along these water bodies throughout the County. Member agencies will also track trends at their specific cleanup locations.

1-D Amount of Litter at Schools Participating in the Litter Outreach Program

ACCWP has developed a request for proposal for a four-year litter reduction education/outreach grant directed at K-12 schools throughout Alameda County. ACCWP intends to award a total of up to $125,000 per year to the successful applicant(s). The goals of the project are to clearly reduce the amount of litter at the participating schools and incorporate institutional changes at the schools so that litter will continue to be reduced in the future. Implementation is scheduled to begin in the 2014/15 school year. The request for proposal will include a requirement to evaluate the level of litter reduction achieved. A copy of the request for proposals is included in the ACCWP Pilot Assessment Strategy. A description of the assessment mechanism(s) of the successful proposal(s) will be included in the ACCWP Fiscal Year 2013/14 Annual Report.

1-E Amount of Litter at Multi-Family Dwellings Participating in the Targeted Outreach Program

Multi-family dwellings (i.e., apartment buildings and condominium complexes) are often areas of high trash generation. ACCWP is working with the City of Livermore to develop a litter reduction pilot targeting multi-family complexes known to be sites with significant litter issues. The pilot includes the following apartment building and condominium complexes: Livermore Garden Apartments (5720 East Avenue), La Castilleja (975 Murrieta Boulevard), and Castilleja Del Arroyo (1001 and 1009 Murrieta Boulevard). The planned assessment mechanisms include:

- December 2013: Pre-campaign Measurement – ACCWP and the City will take baseline measurements of all three sites. Methods of measurement will include taking photos of on-site litter, as well as collecting, characterizing and counting the litter using the Ocean Conservancy's Volunteer Trash Data Form. (Adopt A Creek Spot volunteers use this Data Form to characterize and count the trash collected from the Trash Hot Spot located behind the condominium complexes on Coastal Clean-up Day.) Areas to be measured include landscaped and other common areas, the sidewalk, gutter and streets located in front of the sites. All three property managers/volunteers will collect one week's worth of on-site litter.

- November – December 2013: Research – All three property managers will be interviewed by City staff using twenty-five questions developed by the ACCWP. The interview results will help define the target audience(s) (i.e., age groups, income level, ethnic groups, etc.) and determine outreach tactics (i.e., face-to-face, signage, printed materials, etc.) This information will also assist the City and ACCWP in developing appropriate messaging.

- November 2013 – January 2014: Plan – One of the three sites will be chosen as the "Control" site. In addition, outreach strategies and tactics will be selected for the "Active" sites.

- May 17, 2014 – May 31, 2014: Post-campaign Measurement — City staff and ACCWP will duplicate the pre-campaign measurement methodologies at all three sites, including the Control. All three property managers/volunteers will collect one week's worth of on-site litter. On-site and off-site litter will be characterized and counted by City staff using the Ocean Conservancy's Volunteer Trash Data Form. All three property managers will be interviewed by City staff to help determine residents' attitudes/change in behavior, etc.

- June 1, 2014 – June 30, 2014: Reporting – Final Pilot Report will be presented to ACCWP member agencies.

1-F Self-Reported Litter Related Attitude and Behavior of Residents

Through its Public Information and Participation program ACCWP encourages residents to adopt less polluting behaviors. One targeted behavior is littering. ACCWP uses a variety of mechanisms to influence residents including public service announcements, online and movie theater advertising, outreach to K-12 schools, and participating in outreach events. ACCWP conducts telephone surveys of residents every several years to gauge Alameda County residents' awareness and attitude regarding stormwater related issues. These surveys include questions regarding respondents' reported behavior and attitudes regarding litter and littering. Future surveys will continue to track the long term trends in residents' awareness and attitudes regarding litter and littering.

OUTPUT-BASED INDICATORS

2-A Full capture device operation and maintenance

Consistent with the MRP, adequate inspection and maintenance of trash full capture devices is required to maintain full capture designation by the Water Board. The City of Berkeley is currently developing an operation and maintenance verification program (Trash O&M Verification Program), via ACCWP, to ensure that devices are inspected and maintained at a level that maintains this designation. The ACCWP Trash O&M Verification Program will be modeled on the current O&M verification program for

stormwater treatment controls implemented consistent with the Permit new and redevelopment requirements.

2-B Compliance with the Single-Use Bag Ban

The Alameda County Waste Management Authority is taking the lead on inspection and enforcement of the Single-Use Bag Ban. ACCWP will coordinate with the Waste Management Authority and report on the results of their inspection and enforcement program.

2-C Implementation of an effective street sweeping program

Street sweeping can be very effective in reducing the amount of trash entering the storm drain system. However, its effectiveness is dependent upon the frequency of sweeping and the ability of the sweeper to sweep along the edge of the curb. Parked cars can significantly reduce the effectiveness of a street sweeping program. The City of Berkeley will coordinate with ACCWP to develop, and evaluate the applicability and feasibility of an assessment of its street sweeping program.

2-D Commercial Trash Container Management

Improper trash container management at commercial facilities can be a significant source of trash to the storm drain system. The City of Berkeley will coordinate with ACCWP to develop and implement an assessment of its commercial trash container management program.

2-E Residential Trash Container Management

Fugitive trash from residential trash collection can be a significant source of trash to the storm drain system. The City of Berkeley will coordinate with ACCWP to develop and implement an assessment of its residential trash collection program.

4.2 BASMAA "Tracking California's Trash" Project

The ACCWP Pilot Assessment Strategy described in the previous section recognizes that outcome-based trash assessment methods needed to assess progress toward trash reduction targets are not well established. In an effort to address these information gaps associated with trash assessment methods, the Bay Area Stormwater Management Agencies Association (BASMAA), in collaboration with ACCWP, the 5 Gyres Institute, San Francisco Estuary Partnership, the City of Los Angeles, and other stormwater programs in the Bay Area, developed the *Tracking California's Trash* Project. The Project is funded through a Proposition 84 grant awarded to BASMAA by the State Water Resources Control Board (SWRCB) who recognized the need for standardized trash assessment methods that are robust and cost-effective.

The Project is intended to assist BASMAA member agencies in testing trash assessment and monitoring methods needed to evaluate trash levels in receiving waters, establish control measures that have an equivalent performance to trash full capture devices, and assess progress in trash reduction over time. The following sections provide brief descriptions of tasks that BASMAA will conduct via the three-year Project. Full descriptions of project scopes, deliverables, and outcomes will be developed as part of the task-specific Sampling and Analysis Plans required by the SWRCB during the beginning of the Project. The Project is currently underway and will continue through 2016.

4.2.1 Testing of Trash Monitoring Methods

BASMAA and the 5 Gyres Institute will evaluate the following two types of assessment methods as part of the Project:

- **Trash Flux Monitoring –** Trash flux monitoring is intended quantify the amount of trash flowing in receiving waters under varying hydrological conditions. Flux monitoring will be tested in up to four receiving water bodies in San Francisco Bay and/or the Los Angeles areas. Methods selected for evaluation and monitoring will be based on a literature review conducted during this task and through input from technical advisors and stakeholders. Monitoring is scheduled to begin in 2014 and will be completed in 2016.
- **On-land Visual Assessments –** As part of the Project, BASMAA will also conduct an evaluation of on-land visual assessment methods that are included in the ACCWP Pilot Assessment Strategy. The methods are designed to determine the level of trash on streets and public right-of-ways that may be transported to receiving waters via MS4s. BASMAA plans to conduct field work associated with the evaluation of on-land visual assessment at a number of sites throughout the region. To the extent practical, sites where the on-land methods evaluations take place will be coordinated with trash flux monitoring in receiving waters. On-land assessments will occur in areas that drain to trash full capture devices, and all sites will be assessed during wet and dry weather seasons in order to evaluate on-land methods during varying hydrologic conditions. Monitoring is scheduled to begin in 2014 and will be completed in 2016.

4.2.2 Full Capture Equivalent Studies

Through the implementation of BASMAA's *Tracking California's Trash* grant-funded project, a small set of "Full Capture Equivalent" projects will also be conducted in an attempt to demonstrate that specific combinations of control measures will reduce trash to a level equivalent to full capture devices. Initial BMP combinations include high-frequency street sweeping, and enhanced street sweeping with auto-retractable curb inlet screens. Other combinations will also be considered. Studies are scheduled to begin in 2014 and will be completed in 2016.

4.3 Long-Term Assessment Strategy

The City of Berkeley is committed to the practical reduction of trash and will implement assessment methods post-FY 2016/17 based on the lessons learned from pilot assessments, and as deemed suitable by the City to meet permit requirements. Assessment activities described in the previous sections will evaluate the utility of different assessment methods to demonstrate progress towards trash reduction targets and provide recommended approaches for long-term implementation. Lessons learned will be submitted to the Water Board with the FY 2015-2016 Annual Report and a revised Strategy will be developed and submitted, if necessary. The revised Strategy will include assessment methods that will be used to demonstrate progress during the remaining term of trash reduction requirements.

4.4 Implementation Schedule

The implementation schedule for the ACCWP Pilot Implementation Strategy, BASMAA's Tracking California's Trash project, and the Long-Term Assessment Strategy are included in Table 4-1. Load reduction reporting milestones are also denoted in the table. The schedule is consistent with the need for near-term pilot assessment results to demonstrate progress toward short-term targets, while acknowledging the need for testing and evaluation of assessment methods and protocols prior to long-term implementation.

Table 4-1. Trash progress assessment implementation schedule.

Trash Assessment Programs and Methods	Prior to FY 2013-14	Fiscal Year								
		2013-14[a]	2014-15	2015-16	2016-17[b]	2017-18	2018-19	2019-20	2020-21	2021-22[c]
Pilot Trash Assessment Strategy (ACCWP)										
Single-Use Plastic Bag Assessment	X	X				X				
Expanded Polystyrene Assessment	X	X								
Trash Hot Spot Cleanup Assessment	X	X	X	X	X					
K-12 School Litter Reduction Outreach Program						X				
Multi-Family Dwelling Litter Outreach Program	X									
Residents' Self-Reported Litter-Related Behavior	X					X				
Full Capture Operation and Maintenance Verification			X	X	X					
Single-Use Bag Ban Compliance		X	X	X	X					
Street Sweeping Effectiveness Evaluation			X	X	X					
Commercial Trash Container Management Assessment			X	X	X					
Residential Trash Container Management Assessment			X	X	X					
Tracking California's Trash Project (BASMAA)										
Testing of Trash Monitoring Methods										
Trash Flux Monitoring Protocol Testing			X	X	X					
On-land Visual Assessment Evaluations			X	X	X					
Full Capture Equivalent Studies			X	X	X					
Long-Term Trash Assessment Strategy (ACCWP)						X	X	X	X	X

[a]July 1, 2014 - 40% trash reduction target
[b]July 1, 2017 - 70% trash reduction target
[c]July 1, 2022 - 100% trash reduction target

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